RECLAMATION

Managing Water in the West

Blanco Diversion Dam Dredging Operations – Summary Report

March 2006

Department of the Interior
Bureau of Reclamation
Albuquerque Area Office
Albuquerque, NM

Table of Contents

INTRODUCTION

Concerns were raised in 2005 regarding the timing and effects of the annual dredging maintenance operations at the Rio Blanco Diversion Dam and sedimentation pond/stilling basin on spawning brown trout. Brown trout spawn annually in the fall. Reclamation undertook a field investigation of water quality and streambed geomorphology in an effort to determine if there may be impacts to spawning brown trout from dredging operations.

SAN JUAN-CHAMA PROJECT

The San Juan-Chama Project consists of a system of diversion structures and tunnels for transmountain movement of water from the San Juan River Basin to the Rio Grande Basin. Authorized as a participating project of the Colorado River Storage Project, the San Juan-Chama Project provides an average annual diversion of about 110,000 acre-feet of water from the upper tributaries of the San Juan River. Primary purposes of the San Juan-Chama Project are to furnish a water supply to the middle Rio Grande Valley for municipal, domestic, and industrial uses. The project is also authorized to provide supplemental irrigation water and incidental recreation and fish and wildlife benefits.

The San Juan-Chama Project was authorized by Congress in 1962 through PL 87-483, which amended the Colorado River Storage Act of 1956 (PL 84-485) to allow diversion of Colorado River basin water into the Rio Grande Basin of New Mexico. The original planning projections were for an ultimate diversion of 235,000 acre-feet per year, with an initial phase development for an average annual diversion of up to 110,000 acre-feet. Only the initial phase was authorized and subsequently constructed by Reclamation.

Blanco Diversion Dam

Blanco Diversion Dam is a feature of the San Juan-Chama Project, located in southern Colorado. The purpose of Blanco Diversion Dam is to divert water from the Rio Blanco into the Blanco Feeder Conduit, which conveys the water to the Blanco Tunnel. Construction of Blanco Diversion Dam and Tunnel was awarded on May 11, 1965 and completed on May 22, 1969. Blanco Diversion Dam spans across the Rio Blanco and consists of a concrete overflow weir, sluiceway, and headworks for the Blanco Feeder conduit and Blanco Tunnel. Each abutment consists of vertical concrete wing walls protected by a 2-foot thick layer of riprap on a 1-foot thick layer of sand and gravel.

The spillway is a concrete overflow structure that consists of an uncontrolled, ogee crest weir and fore apron. The spillway is ungated and has no mechanical features. The spillway has a crest length of 50 feet at crest elevation 7867.5. The spillway was designed to pass the 100 year flood, without using the sluiceway. The fore apron is a slotted bucket type structure for energy dissipation. Spillway releases from the slotted bucket discharge into a 30-foot long riprap-protected section of river channel. The riprap is 4 feet thick on a 1-foot thick layer of sand and gravel. The sluiceway is located on the left side of the spillway and consists of a single 5-foot wide bay. The sluiceway is controlled by a 5- by 17- foot radial gate with a gate sill at elevation 7854.5. The sluiceway is operated when downstream flows below elevation 7867.5 are required.

The sluiceway can no longer be operated to sluice sediment as a result of Reclamation's interpretation of Schutz v. Stamm, D. Colo., CIV 74-318.

The headworks structure for the Blanco tunnel consists of a reinforced concrete inlet structure located on the left abutment and the Blanco Feeder Conduit. Flow enters the inlet structure through two sloping trashracked openings with inverts at elevation 7859.25. Flow into the Blanco Feeder Conduit is controlled by either a 16- by 7-foot top seal radial gate with a gate sill at elevation 7859.5 or a 3-foot square bypass controlled by a 3- by 3-foot cast iron slide gate with an invert at elevation 7859.5. The Blanco Feeder Conduit begins downstream of the inlet structure and consists of a 16-foot wide concrete conduit that is approximately 139 feet long and contains a modified Parshall flume. The Blanco Feeder Conduit ends at the inlet structure for the Blanco Tunnel.

ANNUAL DREDGING OPERATIONS

Accumulated sediment, varying in size from large gravels to sandy silt and fine clays is mechanically removed using track excavators, loaders, dozers and dump trucks and occurs usually in October after the diversion season. Annual dredging of accumulated sediment behind the diversion dam and from the sedimentation pond is required to maintain the diversion capacity and minimize downstream impacts to water quality. Dredging may be required more frequently than annually (2 years out of the last 10), depending on the magnitude of the spring runoff and the magnitude and frequency of thunderstorm events.

During mobilization prior to working in the river all equipment is washed and checked for leaks with any necessary corrective action is taken to clean and repair areas where leaks are noted. This is performed several times each day especially prior to work in the river channel. A spill kit is provided at the site to contain and remove any accidental hydraulic leakage. A temporary diversion side channel is constructed around Blanco Diversion Dam along the outside edge of the active stream (see photo No.1 and drawing No. 1). When the diversion channel is connected to the stream, the main channel is blocked off to allow the main riverbed section to be excavated under mainly dry conditions.

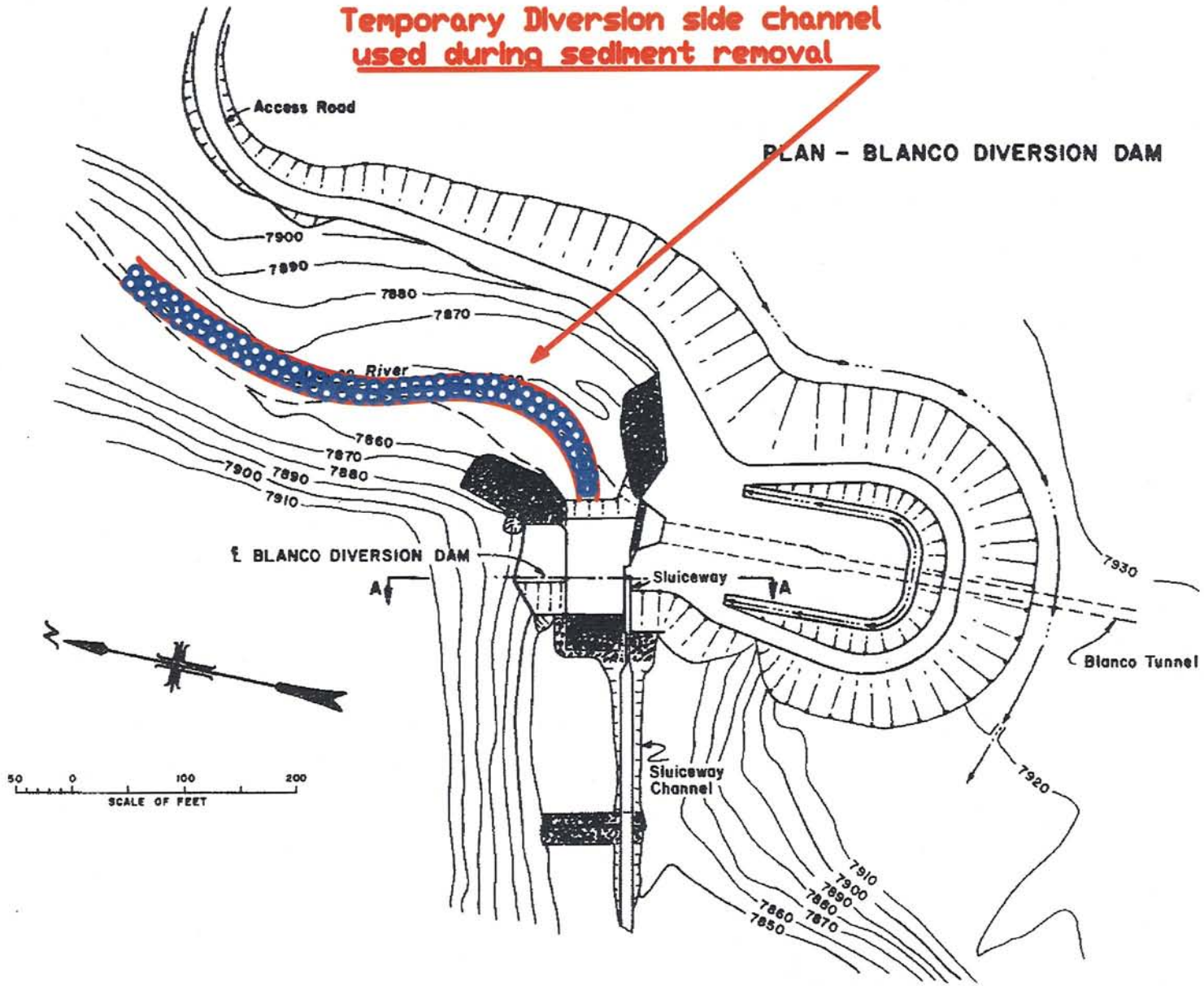
The excavator is used to channel the flow and to remove gravel (see photo No. 2) loading dump trucks from the bank. Dump trucks haul material out of the channel to spoil sites in the vicinity. The only time dump trucks are in the water is when the material next to the trash rack and the wing wall, (Ogee), is being pulled out. The loader is used to load gravel off the bank and is in the water when loading trucks next to trash rack and wing wall. The dozer is used to push material at the stock pile, and is only occasionally used in the water to divert the flow. On rare occasions during above average high diversion years it is required to remove sediment blocking diversion during the runoff season. The sediment accumulation in front of the tunnel inlet is removed by a dragline or long reach excavator from the bank above the inlet then loaded and hauled away in dump trucks. There is no equipment working below the normal high water elevation during that period. All equipment is washed, kept free of oil and grease, before and after use. Equipment is checked daily two and three times for oil leaks and prior to entering the river.

Sediment accumulated in the sediment pond/stilling basin downstream of the diversion dam is removed using the long reach excavator, loaded into dump trucks and taken to nearby spoil areas located outside of the stream course.

Photo No.1 Temporary diversion channel used only for sediment removal. Blanco Diversion Dam.

Photo No.2 Typical view of excess sediment at Blanco Diversion Dam.

San Juan-Chama Project



Drawing No. 1 (404) Permit Application Report

RIVER SURVEY ON THE RIO BLANCO

Two sections of the Rio Blanco were surveyed in October 2005: an upstream reach which is the 500 meter section of river immediately upstream from the Blanco Diversion Dam; and the downstream reach which constitutes approximately 6.5 kilometers (~4 miles) of river upstream from the Hwy 84 bridge crossing. The purpose of the survey was to determine whether fine sediments activated during dredging activities at the diversion dam had the potential of settling downstream in gravel deposits used by spawning brown trout (*Salmo trutta*). Brown trout typically spawn in the fall by excavating a redd (nest) in gravel at the upstream end of riffles; the deposition of fine sediment in the gravel during spawning could adversely affect the trout eggs and larvae. The objectives of this study were to assess the transport potential of fine sediment in the Rio Blanco and survey the most likely locations for fine sediment deposition, the pools. Suitable spawning habitat was also evaluated. The survey is summarized in Appendix B, *River Survey on the Rio Blanco*. Highlights of the survey findings are listed below.

Upstream Reach:

- Steep cascade/step pool planform with very large boulders controlling steps.
- No gravel suitable for brown trout redds was found in the low flow channel.
- Pools are rare.
- Fine sediment completely absent.
- Additions of fine sediment will be rapidly transported out of the reach even at low flows.

Downstream Reach:

- Pool-riffle to plainbed planform with mostly a cobble and coarse gravel substrate.
- Gravel and fine sediment are absent in the riffles and plainbed sections where brown trout would spawn.
- Most gravel deposits are located on the tops of bars which are outside the low flow channel.
- Large volumes of gravel are found around the logjams but there are few logjams (~1 per km).
- Numerous pools are present; pools are currently flushing fine sediment (no filling of sediments).

Based on the findings in the river survey, dredging activities at the Blanco diversion dam do not appear to impact spawning brown trout in the Rio Blanco. Since no suitable spawning gravel was present in the wetted low flow channel in the Upstream Reach, there is no potential for fine sediment deposition impacts to brown trout redds in this reach. The Downstream Reach, even though it could be more responsive to fine sediment accumulation, appears to rapidly transport fines downstream. Although pools are typically the first location of fine sediment deposition, none of the pools in this reach have measurable fine sediment deposition, even the pools immediately downstream from the landslides (a point source for fine sediment). Since fine sediment is not found elsewhere in the reach, a temporary addition of fines is not likely to cause adverse affects to the pools. As gravel deposits are usually outside the low-flow channel, deposition of any fine sediment will not impact spawning gravels for the brown trout.

EFFECTS OF ANNUAL DREDGING ON WATER QUALITY

During the months of September through November 2005, Reclamation deployed instrumentation and personnel to the Rio Blanco basin east of Highway 84 in Archuleta County, Colorado. The deployment was in general conformance with the field monitoring plan designed to capture pertinent data regarding downstream impacts on water quality resulting from annual dredging operations at the Rio Blanco Diversion Dam. Maintenance dredging is required to remove the stream sediment that accumulates behind the diversion dam and that would reduce or eliminate Reclamation's ability to annually divert water.

Information regarding the water quality monitoring effort and the field monitoring plan are attached as Appendix A, *Water Quality Monitoring Report – Rio Blanco Annual Dredging Operations*.

Annual maintenance dredging does not appear to affect the temperature of the water. Dredging appears to temporarily, locally, reduce the pH of the Rio Blanco, but the natural pH appears to increase downstream, and to be more alkaline in the vicinity of the campground than is optimum for trout. Measured dissolved oxygen was above optimum for trout below the dam and at the campground. This natural condition may attenuate with warmer air temperatures. Elevated turbidity coincided with dredging operations, confirmed both visually and by laboratory TSS results. Naturally elevated turbidity was measured above the worksite, possibly due to late season runoff or man-made disturbances. The natural elevated turbidity was in the same range as the impact data recorded downstream of the dredging operations.

While dredging produces daily perturbations to water quality over approximately a one month timeframe, it seems that dredging impacts to water quality are generally no worse than naturally occurring conditions.

CONCLUSIONS

Through the use of best management practices, Reclamation has virtually no impact to the Rio Blanco and the brown trout from dredging operations. Reclamation's water quality monitoring study found that the dredging operations are short in duration and do not appear to greatly change the water quality parameters that were measured. The river survey found that brown trout habitat is of poor quality primarily due to: 1) limited availability of spawning gravels; and 2) limited availability of general habitat for food production.

The studies conducted by Reclamation in 2005 (attached as appendices) found that impacts to water quality are minimal and impacts to brown trout are minimal due to the poor habitat downstream of Blanco Diversion Dam.